Exercise Week13

1. Estimating Pi with Monte Carlo Simulation

Imagining that we have a circle C and a square S, and C inscribed in S. If the diameter of C is 2. Then,

Area of C = 1*1*Pi = Pi
Area of S = 2*2 = 4

(Area of C)/(Area of S) = Pi/4
Pi = ((Area of C)/(Area of S))*4

Thus, if we have the areas of C and S, we can utilize the formula above to calculate Pi. Although Monte Carlo simulation can not provide the exact value of area C and S, we can still use it to estimate the ratio between the two areas. We can imagine that the center of C and S is (0, 0) with a diameter of 2 in a coordination system as following.
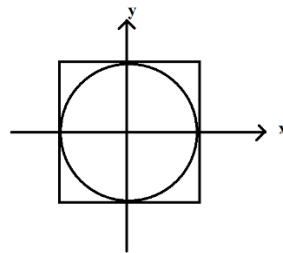
We may randomly generate many points $i = (x_i, y_i)$ in the square S. Since the probability of point i lands in the circle is proportional to area of C, we can approximate the ratio ((Area of C)/(Area of S)) by counting how many points lands in the C and devide it by total points we generated. Please randomly generate 5,000,000 points and use them to estimate Pi. Output Pi to 6 decimal places.

Please name your .ipynb file as YourID_Week13.ipynb and upload it to moodle system. (ex. H3700001_Week13.ipynb)